WHAT IS CLAIMED IS:

1. A magnetic actuator for adjusting a force on a load, comprising:

a first actuating part including a first magnetic element and a second magnetic element;

a second actuating part including a third magnetic element; and

a displacing element attached to said first and second magnetic elements to relatively displace said first and second magnetic elements,

wherein said first actuating part and said second actuating part are constructed and arranged to generate a magnetic force between said both actuating parts in a first direction with a load being attached to one of said first and second actuating parts.

2. The magnetic actuator according to Claim 1, wherein said displacing element comprises a piezoelectric element.

3. The magnetic actuator according to Claim 2, wherein said first, second, and third magnetic elements comprise non-magnetizable materials.

4. The magnetic actuator according Claim 2, wherein said first magnetic element and said second magnetic element are arranged adjacent to each other in the first direction and being separated by a first gap and said displacing element arranged to displace said first magnetic element relative to said second magnetic element in the first direction to generate the adjustment force in the first direction upon a change of the magnetic interaction between said first actuating part and said second actuating part.

5. The magnetic actuator according Claim 4, wherein said displacing element is located in said first gap.

6. The magnetic actuator according Claim 4, wherein said first magnetic element and said second magnetic element comprise a cavity extending in the first direction, and said displacing element is located inside the cavity of said first magnetic element and

inside the cavity of said second magnetic element, said displacing element coupled with said first magnetic element and with said second magnetic element, and having a working length substantially equal to the length of said first and second magnetic elements and the distance of said first gap.

7. The magnetic actuator according to Claim 6, wherein said first, second, and third magnetic elements comprise non-magnetizable materials.

8. The magnetic actuator according Claim 6, wherein said displacing element is located adjacent to both said first and second magnetic elements, said displacing element coupled with said first magnetic element and with said second magnetic element, and having a working length substantially equal to the length of said first and second magnetic elements and the distance of said first gap .

9. The magnetic actuator according Claim 8, wherein for the coupling to said first magnetic element, a first coupling element is provided, and for the coupling of said second magnetic element, a second coupling element is provided.

10. The magnetic actuator according Claim 2, wherein said first actuating part further comprises:

a yoke having an upper part, a lower part, and an intermediate part,

said intermediate part configured with a first surface facing a first end surface of said yoke and a second surface facing a second end surface of said yoke, and

said lower part located below said intermediate part and including a first lower part, a second lower part, and a fourth magnet with a magnetic polarization directed in the second direction, said first and second lower parts, extending lengthwise in the first direction, and said first lower part configured with a third end surface facing a third surface of said intermediate part and said second lower part configured with a fourth end surface facing a fourth surface of said intermediate part,

wherein said intermediate part is displaced based on a magnetic field generated between a first gap distance and a second gap distance, and

wherein said first gap distance is defined by said first surface and said first end surface and by said second surface and said second end surface and said second gap distance defined by said third surface and said third end surface and by said fourth surface and said fourth end surface.

11. The magnetic actuator according to Claim 10, wherein said second magnetic element and said third magnetic element are magnets induced by said fourth magnet.

12. The magnetic actuator according to Claim 11, wherein said intermediate part further includes guiding parts, for guiding the magnetic field of the fourth magnet.

13. The magnetic actuator according to Claim 12, wherein said first surface and said first end surface are slanted surfaces relative to the first direction, and said second surface and said second end surface are slanted surfaces relative to the first direction.

14. The magnetic actuator according to Claim 13, wherein said first, second, and third magnetic elements comprise non-magnetizable materials.

15. A support system to support a load, comprising:

a first actuating part including a first magnetic element and a second magnetic element;

a second actuating part including a third magnetic element; and

a displacing element attached to said first and second magnetic elements to relatively displace said first and second magnetic elements,

wherein said first actuating part and said second actuating part are constructed and arranged to generate a magnetic force between said both actuating parts in a first direction with a load being attached to one of said first and second actuating parts.

16. The support system according to Claim 15, wherein said displacing element comprises a piezoelectric element.

17. The support system according to Claim 16, wherein said first, second, and third magnetic elements comprise non-magnetizable materials.

18. The support system according to Claim 16, wherein said first magnetic element and said second magnetic element are arranged adjacent to each other in the first direction and being separated by a first gap and said displacing element arranged to displace said first magnetic element relative to said second magnetic element in the first direction to generate the adjustment force in the first direction upon a change of the magnetic interaction between said first actuating part and said second actuating part.

19. The support system according Claim 18, wherein said displacing element is located in said first gap.

20. The support system according to Claim 18, wherein said first magnetic element and said second magnetic element comprise a cavity extending in the first direction, and said displacing element is located inside the cavity of said first magnetic element and inside the cavity of said second magnetic element, said displacing element coupled with said first magnetic element and with said second magnetic element, and having a working length substantially equal to the length of said first and second magnetic elements and the distance of said first gap.

21. The support system according to Claim 20, wherein said displacing element is located adjacent to both said first and second magnetic elements, said displacing element coupled with said first magnetic element and with said second magnetic element, and having a working length substantially equal to the length of said first and second magnetic elements and the distance of said first gap.

22. The support system according to Claim 21, wherein for the coupling to said first magnetic element, a first coupling element is provided, and for the coupling of said second magnetic element, a second coupling element is provided.

23. The support system according to according Claim 16, wherein said first actuating part further comprises:

a yoke having an upper part, a lower part, and an intermediate part,

said intermediate part configured with a first surface facing a first end surface of said yoke and a second surface facing a second end surface of said yoke, and

said lower part located below said intermediate part and including a first lower part, a second lower part, and a fourth magnet with a magnetic polarization directed in the second direction, said first and second lower parts extending lengthwise in the first direction, and said first lower part configured with a third end surface facing a third surface of said intermediate part and said second lower part configured with a fourth end surface facing a fourth surface of said intermediate part,

wherein said intermediate part is displaced based on a magnetic field generated between a first gap distance and a second gap distance, and

wherein said first gap distance is defined by said first surface and said first end surface and by said second surface and said second end surface and said second gap distance defined by said third surface and said third end surface and by said fourth surface and said fourth end surface.

24. The support system according to Claim 23, wherein,

said second magnetic element and said third magnetic element are magnets induced by said fourth magnet,

said intermediate part further includes guiding parts for guiding the magnetic field of the fourth magnet, and

said first surface and said first end surface are slanted surfaces relative to the first direction, and said second surface and said second end surface are slanted surfaces relative to the first direction.

25. The support system according to Claim 23, wherein said first, second, and third magnetic elements non-magnetizable materials.

26. A lithographic projection apparatus comprising:

a radiation system to provide a projection beam of radiation;

a support structure for supporting a patterning mechanism that configures said projection beam according to a desired pattern;

a substrate table to hold a substrate;

a projection system to project said patterned beam onto a target portion of said substrate; and

a support structure containing a magnetic actuator having a first actuating part including a first magnetic element and a second magnetic element, a second actuating part including a third magnetic element, and a displacing element attached to said first and second magnetic elements to relatively displace said first and second magnetic elements,

wherein said first actuating part and said second actuating part are constructed and arranged to generate a magnetic force between said both actuating parts in a first direction with a load being attached to one of said first and second actuating parts.

27. The lithographic projection apparatus according to Claim 26, wherein said displacing element comprises a piezoelectric element.

28. The lithographic projection apparatus according to Claim 26, wherein said first, second, and third magnetic elements comprise non-magnetizable materials.

29. The lithographic projection apparatus according to Claim 27, wherein said first magnetic element and said second magnetic element are arranged adjacent to each other in the first direction and being separated by a first gap and said displacing element arranged to displace said first magnetic element relative to said second magnetic element in the first direction to generate the adjustment force in the first direction upon a change of the magnetic interaction between said first actuating part and said second actuating part.

30. The lithographic projection apparatus according to Claim 29, wherein said displacing element is located in said first gap.

31. The lithographic projection apparatus according to Claim 29, wherein said first magnetic element and said second magnetic element comprise a cavity extending in the first direction, and said displacing element is located inside the cavity of said first magnetic element and inside the cavity of said second magnetic element, said displacing element coupled with said first magnetic element and with said second magnetic element, and having a working length substantially equal to the length of said first and second magnetic elements and the distance of said first gap.

32. The lithographic projection apparatus according to Claim 31, wherein said displacing element is located adjacent to both said first and second magnetic elements, said displacing element coupled with said first magnetic element and with said second magnetic element, and having a working length substantially equal to the length of said first and second magnetic elements and the distance of said first gap.

33. The lithographic projection apparatus according to Claim 32, wherein for the coupling to said first magnetic element, a first coupling element is provided, and for the coupling of said second magnetic element, a second coupling element is provided.

34. The lithographic projection apparatus according to Claim 26, wherein said first actuating part further comprises:

a yoke having an upper part, a lower part, and an intermediate part,

said intermediate part configured with a first surface facing a first end surface of said yoke and a second surface facing a second end surface of said yoke, and

said lower part located below said intermediate part and including a first lower part, a second lower part, and a fourth magnet with a magnetic polarization directed in the second direction, said first and second lower parts extending lengthwise in the first direction, and said first lower part configured with a third end surface facing a third surface of said intermediate part and said second lower part configured with a fourth end surface facing a fourth surface of said intermediate part,

wherein said intermediate part is displaced based on a magnetic field generated between a first gap distance and a second gap distance, and

wherein said first gap distance is defined by said first surface and said first end surface and by said second surface and said second end surface and said second gap distance defined by said third surface and said third end surface and by said fourth surface and said fourth end surface.

35. The lithographic projection apparatus according to Claim 34, wherein,

said second magnetic element and said third magnetic element are magnets induced by said fourth magnet,

said intermediate part further includes guiding parts for guiding the magnetic field of the fourth magnet,

said first surface and said first end surface are slanted surfaces relative to the first direction, and said second surface and said second end surface are slanted surfaces relative to the first direction, and

said second and third magnetic elements comprise non-magnetizable materials.

36. A device manufacturing method comprising:

providing a substrate that is at least partially covered by a layer of radiation-sensitive material;

providing a projection beam of radiation using a radiation system;

using a patterning mechanism to endow said projection beam with a pattern in its cross-section;

projecting said patterned beam of radiation onto a target portion of the layer of radiation-sensitive material; and

providing a support structure containing a magnetic actuator having a first actuating part that includes a first magnetic element and a second magnetic element, a second actuating part including a third magnetic element and a displacing element; attached to said first and second magnetic elements to relatively displace said first and second magnetic elements,

wherein said first actuating part and said second actuating part are constructed and arranged to generate a magnetic force between said both actuating parts in a first direction with a load being attached to one of said first and second actuating parts.

37. The method according to Claim 36, wherein said displacing element comprises a piezoelectric element.

38. The method according to Claim 36, wherein said magnetic elements comprise non-magnetizable materials.

39. The method according to Claim 37, further including:

configuring said first magnetic element and said second magnetic element to be adjacent to each other in the first direction and be separated by a first gap, and

configuring said displacing element to displace said first magnetic element relative to said second magnetic element in the first direction to generate the adjustment force in the first direction upon a change of the magnetic interaction between said first actuating part and said second actuating part.

40. The method according to Claim 39, further including disposing said displacing element in said first gap.

41. The method according to Claim 39, further including:

comprise a cavity extending in the first direction by said first magnetic element and said second magnetic element, and

disposing said displacing element inside the cavity of said first magnetic element and inside the cavity of said second magnetic element and coupling said displacing element with said first magnetic element and with said second magnetic element, and having a working length substantially equal to the length of said first and second magnetic elements and the distance of said first gap.

42. The method according to Claim 41, further including:

locating said displacing element adjacent to both said first and second magnetic elements, and

coupling said displacing element with said first magnetic element and with said second magnetic element, and having a working length substantially equal to the length of said first and second magnetic elements and the distance of said first gap.

43. The method according to Claim 42, wherein for the coupling to said first magnetic element, a first coupling element is provided, and for the coupling of said second magnetic element, a second coupling element is provided.

44. The method according to Claim 36, wherein said first actuating part further comprises:

a yoke having an upper part, a lower part, and an intermediate part,

said intermediate part configured with a first surface facing a first end surface of said yoke and a second surface facing a second end surface of said yoke, and

said lower part located below said intermediate part and including a first lower part, a second lower part, and a fourth magnet with a magnetic polarization directed in the second direction, said first and second lower parts extending lengthwise in the first direction, and said first lower part configured with a third end surface facing a third surface of said intermediate part and said second lower part configured with a fourth end surface facing a fourth surface of said intermediate part,

wherein said intermediate part is displaced based on a magnetic field generated between a first gap distance and a second gap distance, and

wherein said first gap distance is defined by said first surface and said first end surface and by said second surface and said second end surface and said second gap distance defined by said third surface and said third end surface and by said fourth surface and said fourth end surface.

45. The method according to Claim 44, further including:

inducing second magnetic element and said third magnetic element by said fourth magnet,

guiding the magnetic field of the fourth magnet by guiding parts, associated with said intermediate part,

configuring said first surface and said first end surface with slanted surfaces relative to the first direction, and

configuring said second surface and said second end surface with slanted surfaces relative to the first direction.

46. The lithographic projection apparatus according to Claim 35, wherein said magnetic elements comprise non-magnetizable materials.